

NOTES ON THE DISTRIBUTION OF SEX AND SHELL CHARACTERS IN
SOME AUSTRALIAN POPULATIONS OF *POTAMOPYRGUS*
(GASTROPODA : HYDROBIIDAE)

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SUMMARY

Figures are presented for the proportions of the sexes and shell types in collections of the fresh water prosobranch *Potamopyrgus* from areas of Australia. Findings are compared with those from populations in New Zealand.

N.B. Representative material from these collections has been deposited in the Australian Museum, Sydney, and from the Victorian localities, also in the National Museum of Victoria, Melbourne.

INTRODUCTION

Snails of the hydrobiid genus *Potamopyrgus* have long been renowned (under sundry names) for their remarkable variability (e.g. Pettard 1888) and since the early decades of this century it has been known that many of them reproduce parthenogenetically (for review and references - Winterbourn 1970 a & b). Such peculiarities make these animals extremely interesting from the standpoint of population genetics - but at the same time it is understandable that some uncertainty surrounds the status of the species in the genus.

Populations of *Potamopyrgus* which are ovo-viviparous, and generally seem capable of reproducing parthenogenetically, are found in Australia, New Zealand and Europe under the names of *P. nigra* (Ouoy & Gaimard), *P. antipodum* (or *antipodarum*) (Gray) and *P. jenkinsi* (Smith) respectively. The question of the identity or otherwise of these three named species (or for that matter the possibility of their further subdivision) will not be discussed here and the generic name will be used on its own to refer to any of these three. No reference will be made to any oviparous members of the genus.

Investigations into the genetics of these snails and the make up of their populations in New Zealand has led to an interest in the basis (genetic, environmental or both) of the widely differing sex ratios found in natural populations. At the same time the occurrence of periostracal spines or other shell 'decoration' continues to present unsolved problems.

Field studies in New Zealand have involved sampling populations from a number of different localities and scoring for sex and shell decoration. Some of these populations

have been repeatedly sampled over a number of years. The percentages of males in these collections have ranged from 0-50 and of decorated shells, from 0-100. Furthermore, under repeated sampling, contrasting populations have maintained their distinction in both respects over more than five years.

During this work a period of leave has been spent in Australia to make some comparisons of populations in the two countries.

METHODS

At each locality, living snails are collected by any convenient means and a sample - generally about 100 and never less than 30 - is examined under a 10X stereo-microscope and the animals sorted according to sex and shell decoration.

Sex is established by holding each snail upside-down under water until its movements give a clear view of the right side of the neck; males being recognised by the penis. To avoid mistakenly classing undeveloped males as females, a lower size limit is imposed. Sorting is done over 1 mm graph paper to allow an approximate estimate of shell length, and individuals of less than 2.5 mm are not scored unless recognisable males below this size are present. In populations of large mature size, this lower limit is raised. Above the limit chosen, any snail without a visible penis is regarded as female - no evidence of adult aphaallic males being known.

Shell decoration is taken to include anything from the finest line down some or all of the whorls to a series of conspicuous spines. Shells on which no such feature is visible are classed as smooth.

RESULTS

Two sets of collections were made in main-land Australia, one around Sydney, the other in the neighbourhood of Melbourne and Geelong. One sample was received from Tasmania.

Maps 1 & 2 indicate by number the localities at which *Potamopyrgus* was found in each mainland district. Counts and percentages obtained are set out, under corresponding numbers, in Table 1.

Size was not recorded in detail but it was noted that the shell length of the main group of mature snails never exceeded 4.45 mm; and in some populations was considerably smaller.

DISCUSSION

Although the information presented here is so limited that further collections may alter the picture considerably, it may still be worth making a few comparisons.

1. Size - The Australian snails are over-all, decidedly smaller than their New Zealand counterparts, though well within the lower range of these.
2. Decoration - The ranges in frequency of decorated shells are much the same in the two countries, and in both the Australian regions, though it was surprising to find no wholly smooth samples among the collections from Victoria.
3. Sex - Males are particularly scarce in the New South Wales collections, having been found only in one of the 28 localities. Even there they only formed about 0.25% of the population. In Victoria males were more abundant, occurring in 5 out of 11 collections and reaching 9% in one. By New Zealand standards however, even this is low.

Direct comparison with equivalent New Zealand figures is difficult as the work there has mainly involved repeated sampling from a restricted number of populations, rather than a general survey. However, by taking only the most recent count for any locality sampled more than once, figures for 73 stations can be assembled for comparison. Table 2 shows the number of these collections which fell into each level of male frequency. It is evident that not only were males found in a greater proportion of the New Zealand collections than in the Australian, but that they commonly formed a much larger percentage of the population.

In this connection it is interesting to recall that in Europe - where *Potamopyrgus* has been spreading since the 1880's, males are a great rarity (Patil 1958).

Dr. W.F. Ponder suggests (personal communication) that the largely female population of the Sydney area could, in a similar way, be associated with recent immigration, for the collections of the Australian Museum contain no specimens of this snail from New South Wales before 1960.

TABLE 1

Data on sex and shell decoration in *Potomopyrgus* from some Australian localities.
(D - decorated shell, S - smooth shell)

No.	Locality	Date Collected	Total	SAMPLE COUNTED						Shells or preserved material available†
				Males		Females		% Males	% D	
				D	S	D	S			
<u>NEW SOUTH WALES (Map 1)</u>										
1	Cattai creek	6/3/75	100	—	—	—	100	0	0	
2	Thornleigh gully 1.	5/3	112	—	—	—	112	0	0	
3	Thornleigh gully 2.	5/3	103	—	—	—	103	0	0	
4	Spring gully	5/3	102	—	—	—	102	0	0	
5	Cowan's creek	5/3	100	—	—	—	100	0	0	
6	Kurin-gai creek 1.	4/3	102	—	—	5	97	0	5	†
7	Kurin-gai creek 2.	9/2	100	—	—	—	100	0	0	†
8a	Never fail creek	9/2	82	—	—	17	65	0	23	†
8b	Never fail creek	4/3	115	—	—	59	66	0	51	
9	Narrabeen creek	4/3	121	—	—	—	121	0	0	†
10	Quarry branch	6/3	101	—	—	—	101	0	0	
11	Vineyard creek	5/3	120	—	—	1	119	0	1	
12	Devlin's creek	5/3	46	—	—	—	33	0	28	
13	Terry's creek	5/3	102	—	—	—	102	0	0	
14	Shrimpton's creek	5/3	88	—	—	—	88	0	0	
15	De Burgh creek	5/3	119	—	—	62	57	0	52	
16	Un-named creek	5/3	100	—	—	97	3	0	97	
17	Stony creek	4/3	78	—	—	—	78	0	0	
18	Rocky creek	5/3	101	—	—	—	101	0	0	
19	Gordon creek	5/3	83	—	—	—	83	0	0	
20	Oxford creek	15/2	121	—	—	—	121	0	0	†
21	Middle creek 1.	15/2	200	—	—	—	200	0	0	†
22	Middle creek 2.	15/2	119	—	—	—	119	0	0	†
23	Middle creek 3.	27/2	104	—	—	—	104	0	0	†
24a	Middle creek 4.	15/2	603*	—	1	77	525	(1)	18	
24b	Middle creek 4.	27/2	255	—	1	32	222	(1)	12	
25	Middle creek 5.	27/2	101	—	—	6	95	0	6	
26	Middle creek 6.	27/2	32	—	—	6	26	0	20	
27a	Middle creek 7.	15/2	262	—	—	253	9	0	95	†
27b	Middle creek 7.	27/2	91	—	—	78	13	0	86	†
28	Little Willandra creek	4/3	119	—	—	10	109	0	9	

* extra numbers counted after finding male.

VICTORIA (Map 2)

1	Stony creek	11/3	117	1	—	69	47	1	60	+
2	Spout creek	11/3	120	9	—	101	10	9	92	+
3	Wauru Ponds	11/3	100	—	—	2	98	0	2	+
4	Barwon river	11/3	178	4	—	120	54	2	70	+
5	Hovell's creek	1. 11/3	169	—	—	65	104	0	38	+
6	Hovell's creek	2. 14/3	58	—	—	12	46	0	21	+
7	Hovell's creek	3. 14/3	33	—	—	8	25	0	24	+
8	Hovell's creek	4. 14/3	61	—	—	1	60	0	1	+
9	Wentbee river	14/3	136	2	3	63	68	4	45	+
10	Skeleton creek	14/3	52	—	—	5	47	0	10	+
11	Kororoit creek	14/3	167	—	6	1	160	4	10	+
TASMANIA										
1	"Muddy creek" W. Side of Tamar estuary (41°20'S, 147°03E)	19/4	154	—	—	22	132	0	14	+

TABLE 2

Percentage of males in a range of New Zealand collections of *Potamopyrgus*

No. of collections represented	Percentage of males
23	0
15	1-9
5	10-19
12	20-29
12	30-39
6	40-50
73	Total

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